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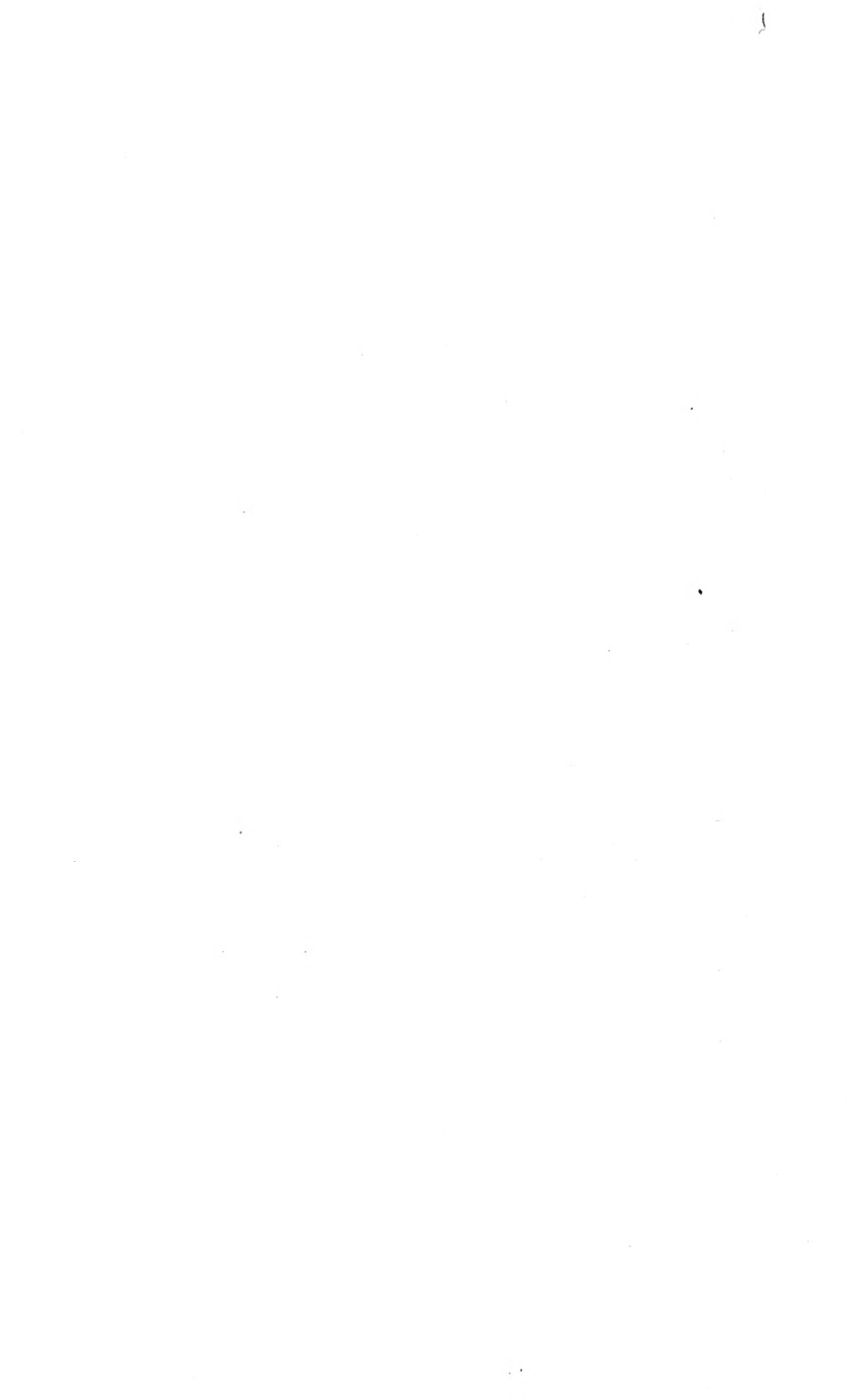
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THE FIRST YEARBOOK

OF THE

NATIONAL SOCIETY FOR THE SCIENTIFIC
STUDY OF EDUCATION

PART II

THE PROGRESS OF GEOGRAPHY IN THE SCHOOLS

BY

W. M. DAVIS

HARVARD UNIVERSITY

A PAPER PREPARED FOR DISCUSSION AT THE GENERAL MEETING OF THE SOCIETY
AT MINNEAPOLIS AT THE TIME OF THE NATIONAL EDUCATIONAL ASSO-
CIATION, JULY 9, 1902, AT 2 P. M.; ALSO AT THE SUMMER
SESSIONS OF UNIVERSITIES AND NORMAL SCHOOLS
IN DIFFERENT SECTIONS OF THE COUNTRY

EDITED BY

CHARLES A. McMURRY

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CONTENTS.

THE PROGRESS OF GEOGRAPHY IN THE SCHOOLS. <i>W. M. Davis</i>	7
1. Encouragement from Recent Progress	7
2. Direction in Which Further Progress Is Most Needed	7
3. Geography Is Too Generally Treated as an Elementary Study	7
4. Illustration from Disputed Boundaries	8
5. Illustration from Immaturity of Geographical Terminology	9
6. Inattention to Mature Geography Has a Bad Effect on School Geography	11
7. Deficiency of Higher Learning in Geography	11
8. Deficiency of Higher Learning Discourages High Ideals	12
9. Value of Principles <i>versus</i> Items, Illustrated by Geometry and Physics	13
10. Examples of Excessive Detail in the Study of Counties	14
11. The Three Stages of Geographical Development	16
12. The Content of Modern Geography	17
13. The Unity of Geography	19
14. The Complexity of Geography	20
15. The Limits of the Sciences	21
16. Systematic and Regional Geography	23
17. Systematic Geography	25
18. Systematic Physiography	25
19. Principles of Systematic Physiography	27
20. Regional Physiography	29
21. Relation of Systematic and Regional Physiography	30
22. Systematic Ontography	32
23. Systematic and Regional Geography	36
24. Relation of Mature Geography to School Geography	37
25. Better Preparation of Teachers	37
26. Better Equipment of Geographical Laboratories	38
27. Replacement of Items by Generalities	39
28. Geographical Facts Must Be Made More Real	40
29. Laboratory Exercises Must Be Specific	42
30. The Rational Element and the Disciplinary Value of Geography Increase Together	43
31. Certain Parts of Geography Are Not Presented in Good Sequence	45
32. Distribution of the Divisions of Geography in Secondary Schools	46
33. Educational Value of Geography	48
THE RELATION OF GEOGRAPHY TO THE SCIENCES. <i>Herbert M. Wilson</i>	49

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NOTICE TO MEMBERS.

The second part of the YEARBOOK for 1902 is herewith sent to each active and associate member.

Besides the meeting for the discussion of these papers on geography at the National Educational Association at Minneapolis, it is expected that meetings will be held this summer at the various summer sessions of universities and normal schools, where these papers on geography can be discussed. It may be well also to arrange meetings for the discussion of the papers on history, previously published in Part I.

The active members are specially requested to organize such meetings and take full charge of them. Let a place and time of meeting be arranged and those desirous of studying the papers be supplied. Any member may secure copies of the YEARBOOK at the usual rates by addressing the University of Chicago Press. Those taking charge of the meetings are requested to report them later to

C. A. McMURRY, *Secretary*.

THE FIRST YEARBOOK.

THE PROGRESS OF GEOGRAPHY IN THE SCHOOLS.

By W. M. DAVIS.

1. *Encouragement from recent progress.*—The most notable characteristic of the condition of geography in the schools during the last ten years is the marked improvement that it has experienced. The improvement accomplished, and still in progress, is most encouraging. The rate of advance is as great as is consistent with sound development. Chief among the impulses toward this march of improvement in geography, as in various other school subjects, have been the reports by committees of specialists, particularly those published by the National Educational Association. These reports have furnished many excellent suggestions which superintendents and teachers have either adopted or discussed; and the discussions thus excited may be considered as beneficial to the subject over which they are held, as were the improvements that were immediately adopted. All this is most gratifying. Let reports, improvements, and discussions continue. Geography in the schools will thrive on them.

2. *Direction in which further progress is most needed.*—There remains, however, much to be done. The one thing which would be above all others most helpful in continuing the progress already made, is the development of a higher ideal as to the content of geography among mature students.

3. *Geography is too generally treated as an elementary study.*—It is a singular fact that there are, particularly in this ambitious country, very few students of geography as a mature subject. Most persons of full age who are directly concerned with geography are engaged in presenting its supposed elements to immature pupils. Very few are engaged in developing geography for mature students. Very few mature students are carrying forward original research in geography of a grade at all comparable to the research now so generally accomplished in various standard mature subjects. How many original

investigators in geography do you know? Ask the same question concerning physics and chemistry, geology, botany and zoölogy, mathematics and astronomy, philology, history, and literature, and make note of the contrast that all these maturely developed subjects present with geography. All these other subjects have habitual representation in our colleges and universities. Many of them engage the attention of professional experts. Geography is seldom recognized in these higher educational reaches. Nor are there, except rarely, professional positions in which mature geographers are employed on advanced work. There are truly many topographers, many pilots, many clerks in post-offices and express companies, many officers of our consular service, all of whom have contact of one kind or another with geography; but there are very few professional geographers, deservedly so called. It is true that many persons travel far and wide over the world, and some of them write very entertaining books; but travel no more makes the traveler a geographer than it makes him a botanist or an historian. Mere facts of occurrence and location have about the same rank in geography that words have in literature, dates in history, and specific names in botany and zoölogy. A traveler's narrative is no more a geographical work because it makes mention of a hill and a harbor than it is a botanical work because it tells something about a forest and a swamp. It is chiefly among the small body of explorers that we find mature geographers; and yet not all of these brave and energetic workers attempt to develop the more scientific aspects of geography. Explorers are generally men of resolute action rather than of an analytical turn of mind; and they too often have about the same relation to mature geography that collectors of wild animals have to mature zoölogy. All of these workers, professional and amateur, contribute their sheaves of fact to the total gathering of geographical knowledge; but the facts thus gathered stand in need of discussion and co-ordination; the sheaves must be threshed and winnowed. The advanced workers, seriously engaged in separating the grain from the chaff and assorting the grain according to its quality, are few indeed.

4. *Illustration from disputed boundaries.*—The boundaries between nations are frequently defined in terms of topographical forms, and one might expect that here at least a mature understanding of geography would have been developed. But there are at present two serious disputes regarding boundaries in which the misunderstandings

arise directly from the treatment of topographical features in an elementary, immature manner. The Argentine-Chilian boundary, as verbally defined in the treaty of 1881, takes no such account of the possible occurrence of transverse, through-going valleys as to predetermine beyond chance of misunderstanding the course of the boundary in such districts where the continental divide departs significantly from the crest line of the cordillera of the Andes. The terms of the treaty appear to have been based on the antiquated idea that mountain ranges must rise between river basins, and that rivers cannot pass through mountain ranges; an idea which, as Prince Kropotkin has shown, has long worked mischief in the cartography of Asia, by placing ranges where none exist, and by omitting them where they occur; an idea which should long ago have disappeared from geography, had the subject been maturely and scientifically developed.

The Alaskan boundary, as verbally defined in the British-Russian treaty of 1825, takes no such account of the possible complexity of mountain form and irregularity of coasts as to preclude misunderstandings that might arise with respect to the summits of mountain ranges, or with respect to outer and inner shore lines. It is true that the treaty here in discussion was made three-quarters of a century ago; yet even at that time the occurrence of detached and discontinuous ranges and of irregular coasts was perfectly well known, and it would seem that the commissioners who framed the treaty might have avoided all possible ambiguity had they based their definitions on a more mature study of topographical forms. I do not propose to express here any opinion regarding the rights in either of these disputes; but only to call attention to the fact that the disputes have resulted from an inadequate comprehension and definition of topographical forms; that is, from the employment of an elementary knowledge of geography in the treatment of a problem where an advanced knowledge would have been much more appropriate.

5. *Illustration from immaturity of geographical terminology.*—Any subject that is pursued from elementary teaching through secondary and collegiate study to the highest reaches of independent investigation is always accompanied by an expanding terminology. The terms that suffice for the beginner do not suffice for the advanced student. The new wine of discovery cannot be held in the old bottles of school-day definitions. It is true that the terminology thus developed is sometimes of an embarrassing fulness. It is sometimes unnecessarily

detailed, but there can be no question that it is on the whole of great value. It is well that the specialist should be cautious about introducing new terms; that he should test his inventions by home use before offering them in print to his colleagues. It is true also that of the total number of terms invented by the specialist in this field or that, many perish, and only the needed ones survive in general scientific use. If it were possible to endow all specialists with so much wisdom that they could foresee the needs of the next generation, and invent only such terms as would prove of permanent value, much of the difficulty that is inherent in the question of terminology would disappear; but such wisdom is not granted to investigators any more than to lawmakers. All that can be expected is that each individual should work carefully and honestly, and that the processes of natural selection and the survival of the fittest should operate in terminology as well as elsewhere. The development of new methods and the discovery of new results make the introduction of new terms inevitable. A good name is of great assistance in making the thing named more generally known. A growing terminology is characteristic of all growing sciences.

In reviewing the literature of geography it is remarkable to note that the terminology of school days is so little extended in the productions of mature writers. Consider, for example, the subject of mountains. Look over any school geography and count the nouns and adjectives that are used with a technical meaning in this chapter of the subject; chain, range, peak, summit, ridge, pass, are among them. Now look over the best essay that can be found in which a mountainous region is described by a mature writer for mature readers, and make another count of the same kind. The adjectives will be found to have "grown up;" that is, they comprise a number of more learned words, such as precipitous, stupendous, imposing, formidable; yet none of these are introduced with anything like technical definitions; they are used in a general literary sense such as will be understood by the polite reader. Among the nouns there will be a moderate number of new words, most of which are taken from the local patois of the mountain people, or from the somewhat colloquial language of mountain climbers; but there is nowhere any sufficient indication that these new words are taken from a systematic, consistent, and thoroughgoing terminology of mountain forms. The same is true of nearly all the other divisions of geography. Even in reports so important as those of the

Mississippi River Commission, certain features of the great river and its flood plain go practically unnamed and therefore unnoticed. The small number of technical geographical terms that have been introduced by a few writers have as yet gained little general currency.

The absence of a mature terminology appropriate to mature geographical descriptions is one of the most patent signs that geography is not maturely developed.

6. *Inattention to mature geography has a bad effect on school geography.*—There can be no question that the neglect of geography as a subject for mature study has had and still has an injurious effect upon the condition of geography in the schools. Special emphasis must be given to this point, for it is not generally enough recognized. One may attend a conference of superintendents and teachers before whom geography is a subject for discussion, and hear much said about this or that aspect of the subject, about this or that device for its presentation, and yet hardly a suggestion may be made to the effect that teachers of geography should be better taught, and still less is an intimation offered that geography itself is in need of more mature development as a scientific study. It is not only in our own country that this complacent attitude prevails: three recent articles by representative foreign authors¹ contain practically no indication that geography in the schools still suffers from lack of preparation on the part of the teacher, and from lack of advanced work on the subject in the universities. These deficiencies are less noticeable in continental schools, particularly in Germany, where it is so often the case that a secondary teacher holds the degree of Doctor of Philosophy; but they are certainly serious in Great Britain, where geography in the schools is a very commonplace study, in spite of the enormous importance of geography to the British empire.

7. *Deficiency of higher learning in geography.*—The most conspicuous evil consequences of this state of things is the want of a well-developed body of higher geographical learning with respect to which the geography in the schools shall stand only as a beginning. It is unfair to look to teachers of the supposed elements of a subject

¹ JAMES BRYCE, "Importance of Geography in Education," *Geographical Journal* (London), Vol. XIX, 1902, pp. 301-313. ELISÉE RECLUS, *L'Enseignement de la Géographie*, Publication No. 5, Université Nouvelle, Institut géographique de Bruxelles, 1901. H. FISCHER, "Zur Methodik des erdkundlichen Schulunterrichts," *Zeitschrift der Gesellschaft für Erdkunde* (Berlin), 1902, pp. 112-142.

for the development of its more advanced parts ; school-teachers are fully occupied with duties of their own. The body of higher learning must be developed in geography as it has been in other subjects, namely, by the devoted work of specialists who give their best thought to the advance of their subject. Many specialists in other sciences are professors in colleges or universities, experts in governmental bureaus, or amateurs of high intellectual rank ; but geography is seldom represented in this goodly company, and hence the development of mature geography is slow. Many subjects that make their beginning under the cover of geography outgrow their shelter and attain an independent maturity. Thus astronomy, geology, botany, zoölogy, history, government, and economics, extracts from whose contents are first introduced into school work along with geography, gain places for themselves in college, while geography disappears. It is as if the trunk subject had subdivided, like an elm, into many divergent branches, each of which flourishes alone. I wish the simile might be that of a sturdy pine whose trunk is not sacrificed, however many limbs it gives forth. There can be little question that, as long as geography is not represented in colleges, the future teachers of geography in the schools will be insufficiently educated in their subject. If the power of this society were turned toward bringing about a better recognition of geography in the colleges and universities, a most advantageous reaction upon the schools would be secured. The result would not be immediate ; it might be slow ; but it would be sure.

8. *Deficiency of higher learning discourages high ideals.*—In the absence of a mature development of our subject, its ideals must be of a low order, and its early steps can make only uncertain progress in advancing toward an unknown goal. What would the Latin, the geometry, the physics of our schools be, if those subjects had no representation in the colleges! How definitely the first steps in these subjects lead toward the great body of their higher learning! How greatly would the geography of the schools be improved if geography had as well established a place in our colleges as history has! I will not here take up the question whether geography is entitled to so universal a recognition. Some educators may think it is not, and certainly the existing distribution of appointments in our colleges would confirm that opinion ; but it may be safely maintained that, if a professorship of geography existed in every college where there is a professorship of history, our ideals as to the mature content of geography would be

much enlarged above what they are today, and our conception of what constitutes the elements of the subject would be correspondingly changed. We should at least be cured of the forlorn idea that geography is only the study of the location of things.

One of the most evident results of the immature development of geography is that details rather than principles have been dwelt upon in school work. This is no longer so true as it was twenty years ago, but it is still too true. It is by no means always the fault of the teachers. It may be due in large part to the low ideals indicated in official examination papers, for if examinations are largely directed to testing a knowledge of the innumerable details of geography, then the teacher must cram the pupil, and cramming trains the memory rather than the intelligence. If emphasis is, on the other hand, given both in teaching and in examinations to general principles and important relations, under which items are adduced simply as illustrations, then the intelligence as well as the memory is developed. Items of occurrence and location are not to be neglected, but they should be studied in their natural relations instead of as isolated facts.

This principle is now pretty generally understood. It is agreed that a cape, a river, a boundary, a city, must not be merely located and memorized, and then set aside, unused, unrelated to anything else; for with teaching of this kind the essential spirit of geography remains dormant. Yet such is the popular pressure for a knowledge of the names and places of things that many things are learned merely by place and name. It is usually held to be necessary to go briefly over a large number of items, even if there is no time to learn their relations without slighting other parts of the subject; but this supposed necessity is open to question. It should be carefully considered whether the names that are learned have been chosen with good judgment from among the countless items of geography; whether they are really chosen at all, or simply inherited from a time when geography had not reached its present development; whether their choice is made with due regard to the higher reaches of geography, and not merely in obedience to a poorly educated public sentiment as to the content of our subject; and finally whether items should after all be given so much prominence as they have often had, with the result of subordinating the large principles under which the items stand only as individual examples.

9. *Value of principles versus items, illustrated by geometry and*

physics.—A possible rearrangement of the emphasis on items and principles in geography may be illustrated by reference to the actual practice in geometry and physics. No good teacher would approve of memorizing the particular figure of a theorem in geometry, with its individual proportion of parts, its attitude on the blackboard, and its special lettering, as a means of learning the general quality of the theorem that the figure illustrates. It is the generality of the theorem that is impressed; it is the possibility of applying a general principle to any particular case that falls under it that must be emphasized in good teaching. So in physics; as much care as may be properly expended on the construction and manipulation of a piece of apparatus, the emphasis of good teaching must be given to the principle which the apparatus is used to illustrate. I believe it is possible to discover and establish general principles in geography likewise, and to teach individual items chiefly as illustrations of the principles under which they fall.

It must be admitted, however, that geometry and physics are not so closely analogous to geography that the best method of study in the first two is, therefore, the best in the third also. The lettering of a chalk figure on a blackboard and the construction of a piece of simple apparatus have no such importance as an actual village in a valley or as an actual island in the sea. Nevertheless geographers may profit by taking heed of the subordination of item to principle in geometry and physics; they may perhaps be thus aided in perceiving the proper relation of the specific to the general in their own subject.

10. *Examples of excessive detail in the study of counties*.—In illustration of excessive attention to detail let me cite certain official examinations that have sometimes included such questions as: "Name the counties in order along the southern border of this state." Such questions have been defended because it is held to be desirable that every inhabitant of a state should know the counties into which his state is divided; but this assumption is wide open to doubt when it is seen that the counties cannot be learned except by sacrificing something else. It is by no means demonstrated that the time demanded in acquiring this knowledge has been used to the best advantage by the pupil. Very little application is made of the knowledge after it is acquired. It would be interesting to inquire of pupils thus trained whether the list of counties is gladly retained in the memory of mature

years, or willingly forgotten. Surely, if forgotten, the loss does not impair the usefulness of a citizen, since the forgotten items can be easily regained when wanted. There are very few of our most intelligent friends who carry in their memories such items as the names and relative position of all the counties in their home state or in any other state, and it is certainly very rarely the case that any well-educated man or woman regards such use of memory as a measure of a cultivated intelligence. Truly, something about counties may well be taught under political geography, and still better under civics. The subdivision of the larger counties of early settlement into smaller counties as population grows, deserves mention in history; and the unorganized "plantations" still found in the backwoods of Maine may well be cited as examples of retarded development, illustrating today a condition through which other states have long ago passed. But, as a matter of fact, while the division of a state into counties is a matter of practical convenience for various purposes of record and administration, the actual counties into which a state is divided are not worth memorizing in competition with the many more educative problems of geography. If counties were the whole content of geography, we might have to learn them all over the country; but they sink into insignificance in comparison with many other matters in the actual content of our subject. If a sheriff, an express agent, or a postal clerk needs to know the counties of a state (very likely not the state in which he was "raised"), he can learn them at short notice, and the rest of us can get along very well by looking up any particular county in an atlas when we want to know something about it; and, by the way, the habit of looking up things in an atlas is worth the memorized lists of the counties in a dozen states. Indeed, in some respects the subdivision of states into counties is outgrown; notably with regard to county prisons, into which all classes of local malefactors are thrown, unclassified, greatly to the injury of many of them, and hence to the harm of the community. This may have been justifiable when means of transportation did not include railroads; but it endures today in the more closely settled states only as the inheritance of an earlier condition which has not yet changed into appropriate relation to its new environment.

The "tier of counties" question is probably less common now than it used to be; but it serves to illustrate very well a low ideal as to the content of geography on the part of examination boards; the subordination

of school work to an uneducated public sentiment that demands of school children a multitude of details, concerning many of which intelligent persons do not regret their ignorance, because their minds are occupied with better things. While the low ideal exists the work of the teacher and the examiner must lead up to it. When the ideal as to the content of geography is raised, school work will rise with it to a higher grade than it now reaches, and then the counties of a state will be counted among the "honorable points of ignorance."

11. *The three stages of geographical development.*—As a means of leading toward higher ideals, let me now attempt to show that geography as a mature subject is capable of a higher development than it has yet reached. In this connection it will be well to review briefly the three stages of development recognizable in the progress of our venerable subject. Until within about a hundred years the content of geography consisted of a body of uncorrelated facts concerning the earth and its inhabitants. The facts were described empirically, and as a rule very imperfectly. Their location was noted, but their correlations were overlooked; it had not indeed been clearly made out that correlations existed. This blindly inductive first stage was followed by a second stage, which was opened by Ritter's exposition of the relationship between the earth and its inhabitants. True, Ritter and his school did not carry the idea of relationship systematically through all parts of the subject; and such relationships as were noted had to be explained on the old doctrine of teleology—the adaptation of the earth to man—instead of on the modern principle of evolution—the adaptation of all the earth's inhabitants to the earth. It is this principle which characterizes the third stage of progress, and along with it goes a principle of almost equal importance; namely, that all the items which enter into the relation between the earth and its inhabitants must be explained as well as described, because explanation aids so powerfully in observing and appreciating the facts of nature. It should be noted that the two great advances by which the third stage of geographical progress is set forward from the second are the contributions of others than geographers; the principle of organic evolution is owed to the biologists; the principles under which explanation is found for the features of the earth are owed chiefly to astronomers, physicists, and geologists. This indebtedness might not have been so heavily contracted if the geographers of the older school had been less content with a purely inductive treatment of their subject; if they had

asked themselves, not only where and what, but also how and why things are as we find them.

12. *The content of modern geography.*— Geography has today entered well upon its third stage of progress. The "causal notion" is generally admitted to be essential in the study of the relation of the earth and its inhabitants. Thus understood, geography involves the knowledge of two great classes of facts; first, all those facts of inorganic environment which enter into relationship with the earth's inhabitants; second, all those responses by which the inhabitants, from the lowest to the highest, have adjusted themselves to their environment. The first of these classes has long been studied as physical geography, although this name has been used as a cover for many irrelevant topics. In recent years there has been a tendency to compress the name into the single word, "physiography."¹

The second of the two classes of facts has not yet reached the point of being named, but perhaps it may come to be called ontography. Ecology, to which increasing attention is given by biologists, is closely related to what I here call ontography, yet there is a distinction between the two, in that ecology is concerned largely with the individual organism, while ontography is intended to include all pertinent facts in structure, physiology, individual, and species.

Neither physiography nor ontography alone is geography proper, for geography involves the relation in which the elements of its two components stand to each other. Each of the components must be well developed before geography can be taken up as a mature study.

The relations involved in geography, as thus understood, are of the most varied nature. A relation that has been frequently quoted since Ritter first called attention to it is the one between the irregularity of continental coast lines and the stage of human development; but a continuous series may be made from this large and general relation to such trifling matters as the relation that determines the point where a common road bridges a stream. Evidently, then, it is not the dimensions of the relation that determine its geographical quality, although its dimensions may have much influence in fixing the stage at which it may

¹ In Great Britain, "physiography" is used under the authority of the South Kensington examinations as the name for a general study of inorganic nature, ranging from geology to astronomy. In the United States physiography is defined by some as the physical geography of the lands; but the Committee of Ten made it equivalent with modern physical geography, and defines it as the study of the physical environment of man.

be profitably introduced in school work, and the emphasis that is to be given to it there. Oceans, lofty mountain ranges, and deserts are formidable barriers that oppose the migration of plants and animals; but from these great controls over the movement of whole species and races a continuous series of examples might be made, leading down to the control that a hill slope exerts over the direction of a plow furrow.

It is not only to the inorganic parts of the earth that man is related, but to the organic parts as well. It is the scarcity of plant and animal food that limits the human population of deserts, just as it is the aridity of climate that limits the number of desert plants and animals. It is the density of forest growth under equatorial rains that has made some of the savage natives of New Guinea expert canoe-men; the rivers there are more available as highways than the plant-crowded land. The relation of population and industries to the cotton, corn, and wheat crop of the United States is a standard geographical problem. Moreover, while attention was formerly given in largest part to the relation of the earth to man, and while this still seems properly enough to characterize the more elementary stages of geography, a large share of attention in its mature stages must be given to the relation of the earth to all kinds of life, and to the interrelations of all kinds of life in so far as they involve considerations of place and space. Cattle are excluded from certain parts of Africa by the tse-tse fly; this is as good geography as is the relation of the Gaelic and English languages to the highlands and lowlands of Scotland. Man was once looked upon as set apart from the rest of organized beings, but this is no longer possible. The devices that he has employed and the battles that he has fought in gaining his present place resemble more than they differ from those by which all plants and animals have gained their places. Indeed, it is but the commonplace of comparative zoölogy today to see in man a great number of structures and processes that have been inherited from a time when he was not man; and many of these structures and processes are responses to his physical environment.

A science cannot be cut off arbitrarily in the midst of a continuous series of relations that characterize it. Geography must consider the ontography of the lowest beings as well as of the highest. It should therefore be our effort, in giving to geography a mature development, to open our conception of its content as widely as possible, rather than to set narrow limits to it; to probe all the elements of physical environment and all the manifestations of life in order to discover examples

of relations that have thus far been overlooked. Only when geography is thus more fully constituted a mature subject will it be possible to make the best selection of those parts which may be considered elementary; only through the development of the higher reaches of the subject can the lower reaches be best ordered. It is for this reason that these somewhat transcendental considerations deserve the attention of thoughtful and progressive teachers.

13. *The unity of geography.*— It is especially the factor of relationship of earth and inhabitants that characterizes geography as a subject apart from other sciences, and that gives an essential unity of content and discipline to all its varied parts. Objection has been made to geography because of its composite nature; it has been reproached with being only a patchwork of scraps from many other subjects, without any essential quality of its own. These assertions do not seem to me to have force: in the first place because other subjects as well as geography are composite if they are judged only by the things that they study, and by the processes employed in their study; and, in the second place, because geography, properly understood, has as well defined an essence of its own as other subjects have.

It is perfectly true that the geographer, even the young geographer, must learn something of the planets in connection with his study of the earth as a globe, something of the behavior of gases in connection with his study of the atmosphere, something of the history of the earth in connection with his study of land forms, something of the structure of plants and animals in connection with the ontographical half of his subject; but it is no less true, that the astronomer must learn something of the earth as a globe in connection with his study of the planets, the physicist must learn something of the atmosphere in connection with his study of gases, the geologist must learn something of existing land forms in connection with his study of the past history of the earth, the biologist must learn something of the lands and the seas in connection with his studies of plants and animals. One is tempted to say that all things seem to be shared by all sciences, and that each science can be defined only in terms of the relation in which it studies things, rather than in terms of the things that it studies. The geographer learns what he wishes to know about the earth as a globe, even though this chapter of his study may be related to astronomy; about the atmosphere, even though he may divide this part of his subject with the physicist; about plants and animals, even if this seems

to be a trespass on biology ; and then he strings all the things he has learned on the thread of the relation between earth and life. The unity of consideration thus gained warrants the inclusion of all these things under his subject of study, and it gives us a right to consider the subject of study as a science-unit.

14. *The complexity of geography.*—It should be no reproach to geography that it is concerned with a large variety of things, some of which are treated elsewhere ; for the same may be said of all the other sciences. Every material thing that is studied by the geographer is also fit for study by the chemist and the physicist. The chemist may wisely inquire into the nature of the elements and compounds that are found in minerals, plants, and animals. The physicist may advisedly study the physical properties of these things and the forces by which they interact. If the chemist and the physicist study in their laboratories rather than outdoors, this is only because they are more interested in systematic than in regional physics and chemistry ; in the establishment of general laws than in the record of individual occurrences. The weathering of a rock surface, the fall of a rock fragment from a cliff, are processes that come under the laws of chemistry and physics ; but the chemist and the physicist do not trouble themselves especially about the innumerable repetitions of these processes in nature ; they are satisfied with establishing the laws that generalize the processes, and with good reason, as I shall show further on.

It should surely be no reproach to the mature geographical investigator that he must study many kinds of things, and that he must share many subjects with other sciences, for all this is equally true of the geologist and the historian. The geologist must know much of chemistry and of physics, much of geography and of biology ; but he strings all his facts on a single thread, the sequence of events in the earth's history, and thus arranged they belong to geology. The historian must know all manner of things in the realms of geography, language, and economics ; and he would do well to know something of biology if he would really appreciate many of man's motives ; but all the facts that he gathers are to be arranged so as to exhibit the sequence and relationship of events in human progress, and thus arranged they belong to history.

Not only do other sciences resemble geography in gathering their items from many fields of knowledge, but like geography they employ many methods in reaching their results. If geographers must follow

the methods of the astronomer in order to understand the earth as a globe, of the physicist in order to appreciate climatic factors, of the geologist in order to understand land forms, of the biologist in order to apprehend the responses of living beings to their environment, they are neither peculiar nor unfortunate in this breadth of exercise. The astronomer has long had to use mathematics, yet astronomy is not mathematics, and mathematics is not astronomy. In recent years the astronomer has had to learn much of physics and chemistry, yet no one thinks of confusing these well-defined sciences on that account. Changes of color on Mars with his change of seasons suggest that the astronomer will soon have to borrow something from the biologist; so much the better if he does, and we may be sure that both astronomy and biology will thrive under the new régime. The chemist constantly employs the methods of the physicist and the mathematician; like everyone else, he uses language to express his thoughts, although language is the special study of the philologist; and he must follow accurate processes of thought if he would reach good results, even though the processes of thought are the special province of the logician.

In view of these comparisons it does not seem to me that geographers need fear that their subject is so complex as to be in danger of disintegrating, provided they give heed to its integrating essence. Geography is complex, like other sciences; but like other sciences, geography is unified by the continuity of its essential quality through all its varied parts. Possibly geography is the most complex of all sciences: some one science must stand at the head of the list in this respect, but it must therein differ only in degree, not in kind from its fellows; and it is yet to be shown that complexity is not an attractive advantage, instead of a deterring disadvantage.

15. *The limits of the sciences.*—Although one may be at much pains to indicate the limits by which his science is reasonably bounded, it does not follow that he must hold himself too narrowly within these limits. Truly, the astronomer is chiefly concerned with the heavenly bodies; but he is welcome to come down, if he wishes, to things terrestrial, and to define the boundary of Colorado in terms of astronomical quantities; but he might as consistently consider himself responsible for the explanation of plant growth during the season when the sunshine is long and strong. The boundary of Colorado by meridians and parallels is as truly a geographical matter, as truly a response to physical environment, as is the settlement of a colony at a

protected bay head, or the building of a beaver dam in the open valley of a small stream.

The geologist may, if he so desires, supplement his historical account of the formation of the Lake Superior iron ores, of the telluric forces by which the ore bodies were deformed, and of the erosion by which they were laid bare, with a consideration of the modern times of discovery and exploitation; and, in order to impress his students with the richness and magnitude of the ore deposits, he may explain how they have led to the development of great business undertakings; and he is perfectly welcome in thus overrunning the fields of geography, history, economics, metallurgy, and so on. The physicist may exemplify the laws of gases by explaining the heat and dryness of the chinook wind, or he may illustrate the laws of fluids in a discussion of the waves of the sea; but the winds and the waves are none the less elements of geographical environment. The historian is welcome to introduce as much geology and geography as he desires into his account of the promontories and bays of Greece; the wonder is, indeed, that he does not do so more freely than is today habitual; he is certainly warranted in explaining the steam engine, the Bessemer process of making steel, and the various applications of electricity as events of high importance in the progress of the last century and a half; and he is fully justified in giving some account of the principles of organic evolution, because they have so profoundly modified philosophical and religious thought in the last third of a century. Surely, all these things are as pertinent to the history of man as are the revolutions of a more military sort.

It is, however, a significant fact that astronomers do not find time to tell anything about the boundary of Colorado; they are too much occupied with their own affairs to take up geographical problems. Geological text-books have no pages to spare for the history of the development of iron ore mining around Lake Superior; they have indeed hardly pages enough to tell all that is desirable as to the origin of the ores. It is only in the largest volumes of history that space is found for accounts of the inventions that have revolutionized the modern world, although these inventions are quite as pertinent to the subject of history as are the tactics of a general on a battlefield. As a matter of fact, such subjects as astronomy, geology, and history are so rich in materials and so well organized in methods that they are seldom tempted to run over other fields than their own; and it is to

this condition of abundant material and well-organized method that I hope to see geography advance. The geographer may, if he wishes, tell about the individual features of other planets than the earth ; but there is so much to say about the earth as a globe that everything about the other planets must be excluded that does not aid the study of our own planet. He may turn back from the present to the past, and describe the results of many geological discoveries ; but it is unwise to do so unless these discoveries bear immediately on present geographical conditions. He may feel tempted to explain the principles of systematic botany and zoölogy, and to enlarge upon the facts of history ; but in so far as these excursions lead him into fields that are outside of geographical relationships, he had better avoid them ; not because such excursions are uninteresting or unprofitable in themselves, but because they take time that can ill be spared from geographical duties. I hope to see the teacher of geography spend his time as carefully as the teacher of geometry or of chemistry does. Let him, by all means, enrich his subject by introducing all manner of pertinent illustrations ; let him show an intimate acquaintance with, and a warm sympathy for all the sciences, but let him be jealous of unwarranted infringements upon the hours allotted to his own science, and earnest in preserving its integrity. Under such a teacher no student will complain that the content of geography is so complex and its methods are so diverse that it has neither unity nor discipline.

16. *Systematic and regional geography.*—The attention given to general principles and to specific items differs greatly in the different sciences. One reason for this is that some sciences are concerned chiefly with the abstract relations or the general properties of things, while others are more concerned with the things themselves. Another reason is that in some sciences a principle or a category of phenomena may be exemplified by a great number of instances, and here a large share of attention is given to the general principles under which the instances may be grouped ; while in others the number of illustrative instances is small, and here attention is given chiefly to individual things.

Geometry and algebra are not concerned with things at all, but only with the relation of the forms and the quantities of things. Their methods are characteristically abstract, mental, deductive, and their resort to diagrams and equations is only as an aid to the memory. All their demonstrations could be performed with the eyes shut, in the

dark, if memory sufficed to follow the necessary operations through the successive steps that lead to the result. Specific instances, as in diagrams and equations, are of value only as illustrations of general principles, as has already been stated. Geometry and algebra are therefore systematic and universal, instead of being local or regional; they have no necessary association with any special place or time.

Physics and chemistry deal with the properties and relations of matter; they necessarily study individual specimens of matter, but this is in order to gain results of general application. They adduce specific instances as examples of general principles; but no one would think of attempting to teach the physics and chemistry of Minnesota, for example, although Minnesota is full of matter and energy; there is not enough of local quality to make the physics and chemistry of a state worth considering apart from the physics and chemistry of the world.

Zoölogy and botany are concerned with things; yet the effort of the zoölogist and botanist is to generalize, both as to the form and growth of the individual and as to the development of the race or species. Thus systematic zoölogy and systematic botany (meaning by these phrases not merely the study of classification, but also of individual growth and of racial development as far as they are generalized) attain a high importance. On the other hand, the individual and the grouping of individuals attract attention, because plants and animals are not uniformly spread over the world. Regional zoölogy and regional botany thus gain an importance that has no likeness in mathematics, physics, or chemistry.

Astronomy is largely specific, particularly so with regard to bodies like planets, of which but few examples are known; yet classification and the establishment of general principles are attempted whenever possible, as, for example, in the grouping together of stars according to their proper motion, their parallax or their spectrum; or in the demonstration that the planets move around the sun in ellipses. The long duration and the systematic movements of most of the things studied in astronomy give the individuals a greater importance than is attained by biological individuals; for the extremely small size, the brief existence, and the unpursuable movements of many organic forms turn attention from the individual to the species. When we come to geography, its traditional treatment is found to be very largely specific, as has been already indicated. The establishment of categories, under

which related phenomena are brought together, is seen in the use of such elementary terms as "river," "coast," "harbor," "city," and so on; but the well-recognized categories are few in number compared to those established in botany and zoölogy; and many of the categories are of so general a nature that they do not suffice to indicate clearly the characteristic features of the things that are brought under them. Moreover, it is so common to give a large share of attention, as has already been pointed out, to such items as name and location, that many a pupil must fail to appreciate the general relations of the examples that he studies. In a word, systematic geography is very poorly developed, while specific or regional geography is overgrown and misshapen. This is as if the botanist gave little attention to the kinds of plants that grow on the earth, and devoted most of his attention to the place of occurrence of his vaguely defined genera.

I therefore invite special attention to the need of developing, as maturely as possible, the systematic side of geography, as one of the means of most effectively improving the condition of geography in the schools.

✓ 17. *Systematic geography* is concerned with the kinds of relationships that exist between the earth and its inhabitants. The actual relationships are countless; the different kinds of relationships are very numerous, although less numerous than the relationships themselves. The number of kinds is so great that it is highly desirable to arrange them according to some scheme of classification, so that similar kinds of relationships may be brought into near association with one another, while unlike relationships may be set farther apart. It thus becomes essential to analyze the relations into the elements that are related, and to divide these elements into as many categories as may be needful, and then to classify these categories. By no other method can confusion be avoided in a subject so large as that with which we are concerned. I therefore propose to outline here some of the chief systematic divisions of the two parts of our subject, and to point out in particular certain divisions whose systematic arrangement is not yet generally agreed upon.

✓ 18. *Systematic physiography*.—The four chief divisions of physiography are the earth as a globe, the atmosphere, the oceans, and the lands; but the content and the order of presentation of these divisions varies in different books, and a fifth division, the distribution of plant and animals, is added by some writers. This addition may be defended

on various grounds in elementary study; but it is always open to the serious objection that it involves an essentially regional treatment, and that it therefore belongs with the regional study of the continents and their physical subdivisions, rather than with the general study of the categories into which the physical features of the earth are divided. It remains to be determined by experiment whether it would not be more useful to limit the proposed fifth division to a systematic consideration of the physiographic factors by which the distribution of plants and animals is controlled, and to place the study of organisms, in so far as it is geographical, under ontography or under regional geography.

Further subdivision of systematic physiography varies greatly with different authors, as may be illustrated by a brief consideration of the treatment of the lands. The older writers gave, as a rule, insufficient attention to this division of the subject, but this defect is now in process of rapid correction. Yet, although the different kinds of land forms are gaining an increasing attention in the newer text-books, the plan of subdivision of this large and important heading is not yet agreed upon. I venture, therefore, to offer for consideration the following outline of a scheme for its mature treatment:

1. The general features of the lands as contrasted with those of the atmosphere, the ocean, and the ocean bottom. The weathering and washing of the land surface and the attack of the sea on the land border result in slow changes of form. Branching valley systems, draining to the sea, are the most characteristic signs of these changes. The long continuation of the destructive changes must result in the reduction of any land surface, however high and uneven at first, to a low, featureless plain, close to sea level; and every example of land form must stand somewhere in the cycle of systematic changes which end in the plain of degradation.

2. The lands may be more specifically treated under three headings: (*a*) land forms of various structures, and in various stages of the process of sculpture; (*b*) streams by which the sculpture is controlled, here including glaciers as a climatic variant of water streams (winds, active in desert regions, have already been treated under the atmosphere; waves and currents, active along the land margin, have been treated under the ocean); (*c*) land waste on its way to the sea. These three headings are to be further subdivided as follows:

- (*a*) Land forms should be subdivided first as to structure, and

second as to stage of development in the cycle of sculpture. The simplest structures should be considered first, and of these coastal plains may well lead the list, while mountains of greatly disordered structure come near its close. Under each of these categories young forms, that is, forms in an early stage of the cycle of sculpture, should be treated first; then mature forms; finally old forms.

(b) Although rivers and valleys have been briefly considered in the introductory account of the lands in general, and although they have been encountered repeatedly in the accounts of the different kinds of land forms, a special subdivision may be well made for their fuller consideration. Here rivers and their valleys form the leading topic, the argument by which the subject is entered; and as such they may be presented in much greater detail than was appropriate when they were only secondary topics, as under land forms.

(c) The forms assumed by the waste of the land on the way to the sea merit recognition; they are fully worthy of an independent place in the scheme of treatment in relatively advanced study, although for more elementary work the topics of this subdivision may be distributed under others.

3. The consequences of special climatic conditions, dry and cold, deserve treatment apart from the consequences of normal climatic conditions; here deserts and glaciated areas may be placed. Any kind of a land form in any stage of sculpture may be now, or may have been recently, arid or glaciated; hence this chapter must follow those which discuss the sculpture of land forms in a normal climate.

4. The shore-line is best given a final chapter to itself, so that all kinds of land forms may be known when the work of the sea upon the lands is taken up. Shore lines should be classified first according to their original outline as determined by the kind of land form on which the sea came to lie when the present relative position of land and sea was assumed; and second according to the advance in the systematic changes that are produced by the action of the sea on the original outline.

19. *Principles of systematic physiography.*—There are several principles of importance to be observed in the treatment of systematic physiography.

The number of categories into which physiographic items are divided should be, as has already been suggested, greatly increased over the usual limit, and the categories should be treated as idealized

types as far as possible. Each category should be illustrated, if possible, by a type diagram, on which the essential features are clearly presented, and from which the unessential details are carefully omitted. Then, in order to connect the ideal with the actual, good examples of the various types should be instanced, the examples being selected chiefly from the home country, but without undue neglect of the rest of the world.

The various categories of the subject must receive explanation as well as description, because of the great aid that comes to the memory through the understanding, and because of the higher order of intelligence that is developed by a rational instead of an empirical consideration of things. Explanation has long been accorded to the phenomena of the atmosphere and of the ocean; it should be applied with equal care to the forms of the land. For this purpose it is necessary to accept in a more whole-souled manner than is customary among geographers the processes of deformation and erosion by which the lands are given their observed forms. It does not suffice to stop at small illustrations, such as sand dunes and gorges; the value of uplift in producing coastal plains, of deformation in producing block mountains, and of erosion in carving the uplifted forms, must be more fully recognized. It is chiefly by the adoption of this principle that the progress of recent years has been made.

It should be observed that, with the explanatory treatment, there comes a good share of deductive consideration, hitherto not consciously recognized as a part of the mental equipment of the geographer in his study of the lands. Although inference and deduction have been abundantly exercised in explaining the winds and the tides, it seems to have been thought that deduction had no place in the treatment of land forms. It may, however, be safely affirmed that, as a matter of good practice, deduction enters largely into any serious attempt at giving systematic explanation to plains and plateaus, mountains and volcanoes, rivers, valleys, and shore lines. This phase of physiographic study deserves careful consideration by those who wish to make the most of the newer methods.

Every category of physiographic elements should be accompanied by examples of the responses made to it by organic forms. It is not enough to take up the organic responses afterward; the habit must be formed of associating these responses with the study of the environing elements. It is too often the case that physiographic features are treated independently, as if they had no connection with the organic

world, even when such connection may be easily found. Such treatment does little toward the formation of the habit of bringing the two halves of geography into their natural relations. The usual treatment of the earth as a globe under the title of mathematical geography gives good illustration of unrelated physiography. It should always be pointed out, in studying this division of the subject, that the wide distribution of organic species is an immediate consequence of the globular form of the earth; for only a globular earth can have its surface so generally level as to permit organic migration over large areas. The restraining effect of mountain ranges as barriers should suffice to show how greatly the facility of movement from place to place over most parts of the earth is dependent on the surface of the globe being not far from level, when considered as a whole. Examples of organic consequences thus related to physiographic controls are the very life of the subject.

Finally, the various categories of physiographic elements should be arranged according to a reasonable system. The elements coexist in nature, but in our study of them their consideration must be linear, one after the other. There is today no generally accepted order of arrangement. For example, the School of Geography of the University of Oxford offers a long vacation course for the summer of 1902, including a series of lectures on "Types of Land Forms and Their Distribution," under which the following headings are announced: "Tablelands, Young Folded Mountains, Denudation Highlands, Plains, and Coastal Regions." Again, a committee of the New York State Science Teachers' Association has lately submitted a report in which shore lines follow the ocean and precede the lands. Evidently discussion is needed on this problem of arrangement in order to bring about some approach to a consistent system. Hence even so subordinate a matter as that of arrangement calls for more serious consideration by mature students than it has yet received.

20. *Regional physiography*.—The physiographic description of a limited region cannot be profitably undertaken until after systematic physiography has been well developed. It is true that the whole content of physiography consists of items gathered from definite localities, and that the parts must be known before the whole; but it is equally true that no well-ordered account of any region can be given until the given facts gathered from many parts of the world have been thoroughly discussed and systematized.

The regional account of Minnesota, for example, involves the position of Minnesota on the globe, and the place of Minnesota with respect to the general system of atmospheric movements, and thus draws something from the first and second divisions of systematic physiography, as above stated. It involves the existence of the state as part of a large land mass, and thus draws something from the general features of the large land masses; and with this goes the effect of a central continental position on climatic conditions. The further account of the state involves the description of all the different kinds of land forms within its borders; if these items are to be presented with best effect, they must follow an order that indicates their general relations, and this draws largely from the systematic study of land forms. It may therefore be urged that the mature development of systematic physiography will do much to advance the mature understanding of regional physiography, and that a student who has carried his systematic studies as far as the condition of the science allows, will make excellent progress when he turns his attention to the study of a limited area. There are, however, very few monographs by which the truth of this contention can be supported; there are, as yet, very few works in which the physiography of a region has been maturely studied in view of a well-developed scheme of systematic physiography.

21. *Relation of systematic and regional physiography.*—The older books on physical geography frequently contained chapters on the several continents, in which the attempt was made to present the actual distribution of the different kinds of physical features that had been briefly explained on earlier pages. The tendency today is to replace the pages formerly allowed to regional description with an extension of the pages allotted to systematic description, for the reason that no sufficient knowledge of the many kinds of things treated in physical geography can be gained if the actual distribution of the many kinds of things over the world is attempted. The increased attention thus given to systematic study is certainly an advantage, and, if the idealized types of systematic study are illustrated by a good number of actual examples from many parts of the world, the student will have no ground of complaint. It is as much a mistake to attempt regional physical geography in the year that is granted to this subject in the high school as it would be to teach the flora or the fauna of various countries in the year that is allotted to botany or zoölogy. All the trend of the newer teaching in the biological sciences is in the direction of a more

appreciative knowledge of typical forms, studied in view of their relations to large problems of growth, classification, and evolution. School study of the distribution of plants and animals is in danger of deteriorating to a mere study of names, and the same is true of regional physical geography. If the description of the continents is attempted in the year that is given to physiography in the high school, the time given to systematic physiography must be very insufficient, and the regional description must therefore be very defective.

There are, however, certain divisions of systematic physiography in which what seems at first to be areal or regional study is advisable; namely, the chapters on the atmosphere and the ocean. The reason for this may be easily seen. The greater features of temperature distribution, atmospheric circulation, rainfall, and climate are really parts of a physiographic phenomenon whose dimensions are as large as the earth. Like the earth itself, the atmospheric shell as a whole must be considered if we wish to acquire an understanding of the relations of its parts. We have but one atmospheric shell with which to deal, and hence the study of its parts, such as the trade winds, the subtropical belts, and so on, becomes specific and to that extent regional. In the study of rivers, on the other hand, there are many examples to illustrate the relations of the various parts—basin, divides, valleys, streams, flood plains, deltas, etc.—and here the treatment necessarily becomes general, with allusion to specific examples only as a means of illustrating general principles.

The atmosphere is not, however, treated wholly by the regional method; for like the parts of rivers which have small dimensions relative to the earth on which they occur, there are in the atmosphere also certain smaller phenomena of frequently repeated occurrence in place or time: these are always given a general instead of a regional treatment, and specific examples from particular regions are cited only as illustrations of the categories under which they fall. Land and sea breezes, mountain and valley winds, thunderstorms and tornadoes are examples of these smaller phenomena: no text-book attempts to describe them all.

It is the same with the ocean. As a continuous and remarkably uniform sheet of water, the actual ocean may be treated as a physiographic unit. Variety in composition, temperature, and movement is limited for the most part to its surface portion; and even here the distribution of temperature and the arrangement of the larger currents

are essentially symmetrical with respect to the equator, as if they were but parts of a large terrestrial phenomenon. When it comes to minor features like local currents, mention can be given to only a few typical examples, such as are afforded by the backset eddies between the Gulf stream and the Carolina coast, by which the cusped capes of that interesting shore line are determined. So with the tides: the unity of this terrestrial phenomenon and its relation to the moon and sun should be pointed out and explained; but the infinite variety of tidal details along the ocean shores can be taught only by means of type examples, each of which is chosen to illustrate a class of tidal movements.

Something of regional treatment may be given to the first subdivision of the chapter on the lands, for the larger continental masses are so few that they naturally take our attention individually as the individual planets take the attention of astronomers. On the other hand, the plan of continental structure and relief is so intricate that it is not yet well resolved even by the most advanced students; hence systematic physiography cannot dwell long on the large divisions of the lands. The continents are best studied under regional physiography.

22. *Systematic ontography*.—We may bring from the systematic study of physiography the conviction that a carefully arranged classification is worth the labor that its preparation has cost. The possession of a scheme of classification fosters the habit of referring newly found items to their proper place among their fellows. Items thus properly placed become much more valuable as elements of a well co-ordinated series than when arranged empirically, as, for example, in the order of acquisition. Let us, then, take up ontography with the intention first of seeking out all manner of individual examples of responses made by organisms to their environment, and then of arranging the examples in a logical order with respect to certain general principles. Thus arranged, similar items are soon generalized into categories, each one of which is described as a type, rationally explained in relation to the factor of physical environment that has produced it, and illustrated by specific examples. There can be little question that the subject will grow rapidly if it is thus cultivated.

It is to be noted that the classification here proposed deals with organic responses as effects, and that the physiographic causes therefore enter only secondarily. In systematic physiography, it was the

causes or controls that were classified, and the organic effects came in secondarily. Thus the threads of physiography and ontography run different ways; they are the warp and the woof whose close interweaving shows us the plexus of relationships that constitute the content of geography proper. On whichever series of considerations one may begin, he will be led over the whole subject if he follows the series to its end.

The chief writer on what I am here calling ontography is Ratzel, who has given an elaborate discussion of human conditions in relation to their surroundings in his *Anthropogeographie*. The subject deserves an even more general and more systematic treatment than it there receives. This is not the place to set forth its many divisions, but I may be permitted to indicate briefly some of the more striking ones.

Every organic species may be considered as possessing certain structures, as carrying on certain habitual life processes, and as occupying certain habitats. Many of the structures, processes, and habitats are responses to physiographic causes; as such they enter into the content of ontography and indicate its three chief divisions. The light bones and feathers of flying birds are a response to their flight through the unsustaining air. The torpidity of many animals during winter is a response to climatic conditions. The division of a genus into several similar species on the different islands of an archipelago, as in the remarkable case of the cassowaries, is the response to the production of the islands by the partial submergence of a once continuous area. Numberless instances of these kinds might be cited.

Each of the three divisions of ontographic responses is of two kinds; the responses of one kind are brought down as inheritances from beginnings in an earlier time, maintained today because their physiographic controls are persistent; these are the more numerous (except, perhaps, as regards habitat). The responses of the other kind are of recent development, and are therefore the more immediate material of ontography. Those of the first kind are, however, only less directly pertinent to ontography, for they are the responses to the palæogeographies of geological time, and can be cut off from those of today only by an arbitrary separation.

The most important inherited responses are those determined by long persistent conditions of environment, such as are common to the physiographies of all ages. The habit of breathing oxygen, for example, universal among plants and animals, may be reasonably

regarded as a response to the widespread occurrence of this gas, uncombined, but active in entering into combination with organic substances, whether it is dissolved in the ocean or free in the atmosphere. A great number of animals have a dorsal and a ventral portion, and an arrangement of skeleton and muscles with respect to the vertical line of gravitative force. This is evidently the result of living on an earth whose mass greatly exceeds that of the organism. Escape from responsibility to omnipresent gravity is possible only for those forms whose density equals that of the medium in which they live, as with many marine animals, or whose minuteness makes them the play of every passing breeze, as with innumerable microscopic organisms.

The difference of coloring of the ventral and dorsal surfaces is the response to the external source of the light by which the earth's surface is illuminated. The downward growth of plant roots and the upward growth of stems seem to be responses both to light and to gravity. All organs of sight, voice, and hearing appear to be responses to physical properties of environing media. The development of these organs has been slow, but, once developed, their profit has been so great that they have been persistently inherited wherever the conditions under which they were developed have endured. Sight is the means of taking notice of the bundle of strongest solar radiations directly incident upon or reflected to the organism; it is given up after being once acquired only by cavern animals living in total darkness. With the development of sight on the part of pursuers, there seems to have come the device of invisibility on the part of some of the pursued, as with those transparent marine organisms that so perfectly imitate the invisibility of the water in which they float. Hearing is the device for taking note of the air or water waves that are excited by some neighboring disturbance. Voice is rarer than hearing, and seems to be especially associated with the organs for air-breathing in the higher vertebrates.

The list of responses of this kind, stated in association with their causes, would be very long before it was complete. There is today, unhappily, no place where the list is to be found on record. All the examples of responses given above may be connected by a continuous series of other examples with the most modern and commonplace illustrations of geographical relationships. It is only under the most arbitrary ruling that the immediate, simple, and manifest responses are considered pertinent to geography, while the remote, complex, and

obscure responses are referred to some other science or neglected altogether. The resort to talus crevices for shelter by beasts, and to overhanging ledges by man; the use of mud by wasps, of twigs by birds, of wood, stone, or ice by man in building shelters; the housing of colonies of bank-swallows in sand banks and of communities of Chinese in loess bluffs; the settlement of beavers on watercourses, of men at fords and harbor heads; the gathering of a manufacturing population about the water-power of modern Niagara; all these are examples of the ontographical habit that organized beings have of taking advantage of their surroundings. All the content of economic or commercial geography, whose modern development is of so promising an interest, is but a manifestation of a special phase of this universal habit. It is of course desirable to select the simple, the manifest, or the "important" for exposition in elementary teaching; but the mature geographer can be satisfied with no such arbitrary bounds for his study.

The location of roads between neighboring villages on a plain, of highways over passes, of tunnels through mountains, of ship channels in harbors, offer many examples of responses to physiographic controls. The course of the paths beaten down by wild animals in the jungle, of the trails worn by cattle on their way to the rare watering places of arid regions, of the lanes followed by pillaging ants, offer equally good, although less conspicuous, examples of the same kind. The fleetness, the endurance, the venom, of the animals of arid deserts have been instanced as striking examples of responses to an environment where the maintenance of life is difficult. The spirit of independence characteristic of the Swiss has been regarded by one writer as the cause of the maintenance of independent organization even in very small village communities; but it has lately been shown by Lugeon that the physiographic conditions inherent in valleys among lofty mountains are such that only small villages can be developed; and thus interpreted the spirit of independence must be regarded as the result of the ontographic subdivision of Swiss settlements into small villages. The growth and distribution of plants of different kinds, as influenced by rocky surfaces, composition of soil, depth and abundance of ground water—problems of modern ecology—are all of as strictly a geographical nature as is the distribution of human populations, and all may be treated systematically or regionally.

Ontography should be pursued even into forms of language and habits of thought. It is well known that mountaineers have a greater

number of terms for peaks, ridges, and passes than are to be found among the inhabitants of plains; that dwellers in the deserts find need of giving different names to various kinds of sand dunes, while the people of a moister climate get along very well with only one. "The river of life" and "the valley of the shadow of death" are figures of a manifestly geographical origin, while "amount," "insulate," and "isolate" involve somewhat concealed geographical figures; but the origin of "rival," "derive," and "arrive" in a geographical root would be hardly noticed by anyone but a philologist, yet these words certainly serve to show the importance that has long been given to the shore line that divides land and water. In how many other ways language is ontographical, no one has yet learned. Fewkes has shown how largely the religious ceremonial of certain Indian tribes of the arid Southwest is based on climatic conditions; thunder clouds and lightning flashes are conventionalized in religious decoration. We are perhaps prepared to ascribe the simple religions of pagan savages in greater or less degree to physiographic sources; but it seldom occurs to us that the position and the character of the heaven and the hell that are so closely bound up with the faith of many a Christian are of an equally physiographical origin. The ontographical half of geography will have abundant material when it is taken up for serious study by mature students.

The content and treatment of courses on regional ontography can be inferred from what precedes; they cannot be detailed here, for lack of space, but they would include all that is commonly understood by political and commercial (economic) geography, along with a greater emphasis on the relation of these effects to their causes than is commonly allowed.

23. *Systematic and regional geography*.—Systematic geography is the orderly study of the relations between all the categories of physiography and ontography. Regional geography is the orderly study of all these relations that are manifested in a limited area. It would be premature to attempt now to state the order in which the categories of geography, thus understood, should be taken up. That is a matter which may well engage the attention of mature geographers for some time to come without exhausting the discussion that it deserves. My object in devoting a paragraph to the heading above is to reiterate the necessity of carrying forward mature geographical study toward the goal here indicated, as a practical means of improving the condition of geography in the schools. The elements of the subject, most fit for

presentation in the schools, cannot be determined until the subject, as a whole, is more thoroughly discussed than it is today; and the presentation of the elements cannot be of the best while the teachers, as a rule, have a knowledge of the subject that is as far below the capacity of their years as is now generally the case.

24. *Relation of mature geography to school geography.*—I have made free in the foregoing pages to consider the higher reaches of geographical study, because it seems to me otherwise impossible to make wise plans for the lower reaches; but, in order that this paper shall not be concerned too largely with questions that may seem almost transcendental, it may close with what may be popularly called a few “practical suggestions,” though, for my own part, I believe that all the suggestions here made have a practical bearing on school teaching.

25. *Better preparation of teachers.*—One of the most direct results that would follow from the more general pursuit of geography as a mature study would be the improvement in the preparation of teachers. This is an improvement that is, according to my experience, sadly needed. The acquaintance that I have made during a number of sessions of the Harvard summer course in geography has convinced me that teachers of geography are by no means informed up to their capacity even concerning the elementary aspects of their subject. The idea that most bays are merely drowned valleys is a surprise to many teachers; the idea that a river which exhibits the “normal” sequence of parts usually described is a mature river, and that young and old rivers must normally have a different arrangement of parts, is a novelty to them. The widespread distribution of species and the extended development of commerce have seldom been considered rationally as the responses to the opportunities for movement offered by a globular earth. The division of mankind into races has been usually treated empirically, instead of as primarily a response to the continental division of the lands, and secondarily to important mountain and desert barriers. There is no lack of a conscientious desire nor of a capacity to learn; but the conclusion has been forced upon me that many of the teachers whom I have met have been intellectually half-starved in their previous study of geography; and yet the teachers to whom I refer may be fairly considered as of better than average quality, for the very reason that they have spent their summer vacations in trying to make themselves better still. It is not necessary to inquire here into the causes of their deficient training, but the

remedy of the deficiency may be looked for with much confidence in the elevation of the general status of geographical study that would accompany its habitual treatment by specialists in colleges and universities. It is important to emphasize in this connection the need of a broader and higher preparation for teachers, so that they may know a good deal more than they have to teach, and thus gain the easy mind that characterizes the proficient expert. The recognition of geography by colleges and universities will, I believe, do more than anything else to realize this desirable end. The individual teachers who may read this paragraph will not be able alone to exert much pressure toward a change to a better order of things in this respect; but the organized body of teachers and superintendents that constitutes the National Educational Association can do much in this direction, if they are once fully persuaded of the need of doing it.

26. *Better equipment of geographical laboratories.*—It is not so very long ago that physical and chemical laboratories were unknown even in the best secondary schools. The rapid development of observational and experimental teaching in these subjects makes me hope that the time may not be long distant when the best high schools will, as a matter of course, be provided with a room that may properly be called a geographical laboratory, and that this room will contain a good working collection of material for the observational study of geographical problems. Some such laboratories already exist. As strong an organization as that of the New York State Science Teachers Association has favorably considered the appointment of a committee to prepare a report upon the proper equipment of a geographical laboratory; and a collection of materials for geographical teaching has lately been exhibited in Iowa. All this may fairly be taken as a hopeful sign of the times. When the grammar schools take up the idea of practical work in geography, the matter of laboratory equipment will become of so large commercial importance that publishers will enter the field; and the walls, racks, and tables of the school-room will not be so bare as they are today. But it is evident that the better preparation of teachers must precede the fuller equipment of laboratories, and that the teachers must have become familiar in their own training with the use of abundant laboratory materials, such as should be found in institutions of higher learning, but such as are today too generally wanting even there. Among the materials most needed are wall maps, not merely of climatic elements, of oceans, and

of continents, but of typical features of continents also ; good pictures and maps of the actual examples by which type forms are illustrated, models of land forms, lantern slides in large variety, well-selected series of weather maps, plentiful large scale topographical maps such as are published by our various governmental bureaus, and so on. Those who are known to have gathered together a laboratory equipment of this kind are frequently in receipt of letters from superintendents and teachers, asking how the collection may be duplicated ; and the letters are difficult to answer, because the collections have been brought together piecemeal. But it is a hopeful sign that dealers in lantern slides are getting out catalogues of subjects especially selected for the illustration of physical geography ; and the coming decade will undoubtedly see further progress in this line. Yet here again it will only be a repetition of the experience in physics and chemistry, in botany and zoölogy, if the laboratory equipment for teaching geography in schools is largely developed in the more fully furnished laboratories of our colleges.

27. *Replacement of items by generalities.*—The hopeful progress that school geography has made in the last twenty years is characterized largely by a diminution in the number of isolated empirical items to be committed to memory, and by a corresponding increase in the number of principles and generalizations to be intelligently studied. There is no reason for thinking that this progress has reached its limit ; there is, on the other hand, much ground for believing that, as the teachers and the teachers of teachers of geography gain a larger and broader understanding of the subject in its mature development, the replacement of the lonesome empirical item by the rational category, under which the items are grouped in good fellowship, will continue to increase beyond its present moderate measure. Items must still be presented in abundance, for young pupils need plenty of specific information ; but the items should be introduced in illustration of the categories to which they belong, rather than as sufficient unto themselves. In the earlier years of school study, the items ought to precede the category and the generalization, for first progress must be largely inductive ; but, by the time that the high school is reached, and probably for a year or two sooner, deduction may be used to a significant extent ; that is, the generality may be presented first, and the items may then follow as deductions from it, instead of preceding as elements of its induction. Many teachers are already using the deductive method in teaching the

distribution of wet and dry regions as determined by the relation of mountain ranges to the terrestrial wind system ; and the success of the method there testifies to the success that may be expected in other cases where the mental processes involved are of a simple and safe order. This matter deserves more emphasis and amplification than I can give it here ; suffice it to say that geography will become more and more a scientific study in proportion to the use that is made of the fully developed scientific method, which always involves deduction along with induction in treating problems where any of the essential facts are unseen.

As geography becomes rational, the purely *memoriter* method will hold lower and lower rank in its lessons. Such a topic as state capitals, learned in old-fashioned days as a monotonous recitation, may be enlivened by an enlarged treatment in which many other facts than mere name are associated with the capital city. Many of these peripheral facts may be forgotten, but the central fact will remain more firmly fastened in the memory than if it had but one empirical attachment. So with state boundaries ; the mere recitation of boundaries, apart from the geographical relations of the boundaries, is dull work ; dull in the book, dull in the teacher, dulling in the pupil. Instead of having such matters learned as mere feats of unreasoning, unassociated memory, they should always be combined in a rational way with other things, so as to make for intelligence, and to develop in the pupil the habit of looking for the meaning of things, instead of dulling or even repressing that excellent habit. When rivers are taught only by name and place, it must be that little more is said about them in the text-book and known about them by the teacher. It is very questionable whether it is worth while to use any share of school hours in learning so slender a geographical item as the mere name of a river. It would be much better to omit altogether the account of a country that is thus treated in earlier school years, and to take it up for the first time when its general geography is treated in such a manner that mountains, climate, rivers, products, and cities are properly associated. It is well known that the best schools are making excellent progress in such lines as these ; but it is not yet time to flatter ourselves that pressure toward such progress is unnecessary.

28. *Geographical facts must be made more real.* —I recall the true story of a little girl learning her lesson in a question-and-answer geography. *Ques.* "Do the stars shine by day as well as by night?"

Ans. "They do." The little victim was seen rocking herself to and fro, as if to give even a muscular aid to her memory, and repeating, "They do, they do, they do—they do, they do, they do." The theory of teaching has far outgrown such absurdities, but the practice has not, and we must continue to protest against them. I have in my own experience seen members of a class of teachers try to answer the question: "Why are the days longer than the nights in summer?" by recalling the words from some printed page instead of by attempting to visualize the plain facts of nature. The moral of this is that the facts of geography must be made more real than they can be by studying only the words of a book. All sorts of observational devices must be summoned to the aid of the printed page. The importance of this principle will be more fully realized when it is recalled that children can know much more than they can say; that their power of observation is far greater than that of expression; and that equality of these two powers is not always reached even in mature minds. In order, therefore, that the little that young pupils can say about geography should be properly proportioned to their whole mental acquaintance with the subject, they should be provided with material, especially with material for observation, in much larger quantity than they are expected to recite, and in much more realistic form than mere names and definitions of unknown things.

Yet such is our servitude to conventional methods that we constantly fail to teach by things; the teaching by words is so much easier. Consider, for example, the rotation of the earth. What is simpler than to observe in an effective manner the elementary facts upon which this extraordinary conclusion is based, and yet how few school children ever learn these facts by well directed observation before they learn the verbal statement of the conclusion printed in a text-book. There is no inherent difficulty in having the necessary observations made by school children at different hours during a two-session school day; particularly that most significant observation, that on the second day the sun can be seen to approach from the eastern side of the sky the position that it had in the sky twenty-four hours before. Again, with latitude, in how many schools of our country are the necessary facts taught by observation before the terms are introduced, and definitions are memorized? Yet here induction is surely the safe and sound method. I am convinced that the vagueness of popular understanding about things of this kind comes from an over-emphasis of verbal defi-

nitions in school years, while facts easily observed are under-emphasized. It would be well to replace the names, diameters, and distances of the planets—matters of small geographical import in any case—with the observational proof that there are planets—other earths—to be seen in the sky, and that young observers can easily follow them among the stars. All these errors of method would be reduced or excluded if the teacher were perfectly easy minded on such problems; and the easy mind is best gained through practical acquaintance with observational methods such as should characterize the more mature stages of geographical study.

Geography indoors should be as largely as possible supplemented by outdoor observations by the pupils; yet I have found a great diffidence among teachers as to outdoor observation, even on their own part. They may have learned very well indeed everything that a book has to say about the origin of valleys; they may profess belief in the destructive work of the streams that flow through the valleys; yet, when it comes to taking a class of children outdoors and using the examples of geographical forms, such as the neighborhood affords, there is too often an undue hesitation. The teacher's lack of self-confidence would be greatly diminished if her own school work had been more liberally guided, and if her days of professional preparation had been spent in the consideration of a decidedly more mature phase of geography than that on which her skill is afterward to be exercised.

29. *Laboratory exercises must be specific.*—With an increasing realization of geographical facts will come an increasing accuracy and definiteness of knowledge about them; and this will be a great advance, for at present geographical ideas are apt to be hazy. My recent experience with Harvard admission examinations in physiography leads me to fear that pupils in secondary schools do not look upon this division of geography as capable of clear statement, such as they know is expected in Latin and geometry. The answers to such a question as, "Describe and show by diagrams the development of a valley and its flood plain from a young to a mature stage," indicate too often a vagueness of understanding that is extremely disappointing, the more so in that it reflects imperfect methods of teaching as well as of learning. The correction of this difficulty is not to be secured by insisting on precise verbal recitations from the text-book, any more than similar difficulties in geometry would be overcome by insisting on verbatim recitation of theorems. The needed reform will be

found in realistic exercises in geography corresponding to blackboard demonstrations and graphic constructions in geometry. But it is essential that the realistic exercises in the geographical laboratory should be carefully planned, in order that they should be closely pertinent to and illustrative of the text, and that they should call for accurate thinking and performance on the part of the pupil. The elaboration of a series of fifty or more such exercises in physiography is greatly needed; and those who have experience in work of this kind should be encouraged to give specific account of their methods in some of our educational journals, or, better yet, to prepare laboratory manuals in which explicit directions shall be given as to outfit and process. Among the simplest and at the same time most valuable exercises of this kind for the chapters on land forms, mention may be made of the drawing of outline maps from block diagrams of typical forms. The block diagram being an oblique bird's-eye view, and the map being seen from directly overhead, there is just enough difference between the two to require intelligence in changing the diagram to the map, and yet not to demand more than elementary geographical knowledge and simple manual skill. Maps thus prepared should always be accompanied by a descriptive and explanatory text.

Laboratory exercises should not be limited to physiography; they should be devised for all divisions of geography, for the devices by which the reality of geographical items and the truth of geographical principles are to be impressed on young pupils cannot be compressed into a text-book. They are the peculiar responsibility of the teacher and the laboratory. Just as the breadth of opportunity in a university increases with the abundance of its funds, so the variety of devices by which school children are aided in their studies will increase with the liberality of a teacher's preparation. One of the most promising of all methods towards escape from enslavement to verbal texts is the cultivation of a body of higher learning, and the encouragement of teachers to acquire larger and larger part of it, however elementary their later teaching may be.

30. *The rational element and the disciplinary value of geography increase together.*—It is very likely that one of the reasons for the general omission of geography from the list of college studies is that it does not, as ordinarily treated, afford sufficient intellectual discipline to gain a place among other subjects whose value in this respect is held to be greater. It is noticeable, however, that physical geography has a

more general representation in colleges than any other branch of the subject. Hence it may be expected that other branches will gain a place as fast as they prove themselves worthy of it, by showing that they may be as disciplinary and profitable as physical geography is. However this may be, there can be no question that the disciplinary side of geography deserves more emphasis than it has usually received in school teaching. The remarks made above as to the rank of the "tier of counties" question are pertinent to this paragraph also. There is every reason to hope that, commensurate with the development of a body of higher learning in geography, there will be an increase of the disciplinary value of school geography. Let it not be forgotten that good progress in this direction is already being made. The intelligent use of weather maps, for example, is a case in point. No wide-awake teacher of physical geography today can be content without using a series of actual weather maps in illustration of weather types; the exercises that may be based on these maps are disciplinary in a high degree. The records shown on the maps may be given a real value by comparing them with local school records. The discussion of the map records offers admirable training in induction, generalization and deduction. Exercises may be made of a very practical kind, training the hand in construction and the mind in expression. The knowledge thus gained leaves little room for credulity in a subject where credulity has long flourished. How different all this is from the old-fashioned empirical description of weather changes! Studies of this kind inculcate a really scientific method; they make for intelligence as against mere docility; they aid in opening a broad understanding of the processes of nature; and yet accessible as weather maps are today, simple as are the methods of their practical disciplinary use, it is rarely the case that they are used to their full value, even in high schools, much less in grammar schools.

Every good thing that may be said about weather maps may be said with equal value about studies of land forms, provided the study is based on laboratory material as appropriate to the needs of this division of geography as weather maps are to the other. But while weather maps are very generally available, models of land forms are relatively rare and expensive. The most disciplinary results in this division of the subject must therefore wait until models are made and used in greater number in college teaching, until the teachers of teachers become familiar with the models during their college course,

until the intending teachers of geography are made acquainted with a good variety of typical models in their own high school and normal school course, and until the models themselves are demanded for the future geographical laboratories in high schools and grammar schools. It is largely for the National Educational Association to say whether our great-grandchildren or our grandchildren or our children shall be the beneficiaries of such improvements as better laboratory equipment will aid in bringing about.

31. *Certain parts of geography are not presented in good sequence.*—With the various improvements already noted, we may expect to see a better sequence established in the order of introduction of certain elements of geographical study. As the rational method is further developed, there will be a decrease in the number of things that are empirically introduced on account of their asserted importance, even though they must be given an empirical instead of an explanatory treatment. It may be going too far to say that this class of topics will ever be as completely excluded from geography as it is from such purely deductive studies as geometry and algebra, where no one pretends to introduce a theorem or a principle before it can be logically approached by a series of preparatory steps; yet it should be noted that in subjects such as physics and chemistry, where inductive and deductive methods are combined, the sequence of topics is logical—hardly less logical than in mathematics. It is not customary to make an empirical statement concerning entropy in an elementary text-book on physics, however important the principle of entropy may be to the more advanced student. Again, a careful selection of things to be studied is noticeable in the modern books on botany and zoölogy, although this method involves the omission of all mention of many plants and animals that were formerly included in more comprehensive texts on natural history; this is because a real knowledge of a few things that may be studied observationally is held to be of greater value than a nominal knowledge of a greater variety of things.

Certain divisions of geography seem to be in need of a critical examination as to the logical sequence of their parts. There are at present too many instances in which the introduction of a topic seems to be more indicative of a desire on the part of the author of the text-book to display his knowledge than of a judicious estimate as to what is appropriate to the pupils who are to use the book. The treatment

of the tides sometimes offers illustration of this difficulty. It is as if the author felt bound to make mention of certain facts or theories because of a supposed public or scientific demand for them, even though they may involve principles which the pupils who are to use the book cannot be expected to have learned. The theory of the general circulation of the atmosphere and the effect of the earth's rotation on the course of the winds afford similar instances of the attempted introduction of relatively advanced explanations into elementary texts, because of a supposed conventional or popular demand for them. A way out of the difficulty in these cases may be found by touching very lightly on the more involved parts of the explanation, and by replacing the more difficult parts with a selection from the abundant matters of fact which can be easily apprehended, and which go far toward forming a sound basis on which real explanation may be based in later years.

The flattening of the earth at the poles is given an exaggerated importance by being included in the first account of the globular form of the earth. The explanation of the seasons is often attempted before the pupil has gained any inductive basis for the capital fact of the earth's annual revolution around the sun. Latitude and longitude are as a rule introduced too early. The methods of finding latitude that are sometimes taught include data empirically provided by the teacher. Rearrangement is needed in all such cases if geography is to become largely disciplinary.

32. *Distribution of the divisions of geography in secondary schools.*—General descriptive geography, which constitutes the body of the subject in the years before the high school, need not be subdivided according to the scheme of classification of the divisions of geography given above. It makes a beginning in all of the divisions. As at present conducted, good progress toward better methods is everywhere noticeable, but there is still room for a greater development of systematic, explanatory, and realistic treatment, as has been indicated on the preceding pages. Change in the order of parts is not seriously demanded; change in the proportion and emphasis of parts is going on in a wholesome manner, and largely in the direction here advocated. Among the results of these changes is a possible saving of time by the omission of unnecessary details, so as to permit the introduction of elementary systematic physiography in the last year before the high school. There are many reasons for this change, which I

have elsewhere set forth at some length;¹ but it may be here noted that the change would have the beneficial result of presenting some of the outlines of physiography to a greatly increased number of school children; and if the subject really has the educational value that is claimed for it, this would be a national blessing.

High-school geography should be of two kinds. If the feeding lower schools do not provide a course in elementary physiography, then the high school must provide it, and by preference in an early year. If no special course on regional physiography, such as the physiography of the United States or of North America, is offered, then the systematic course should give as many specific illustrations of its categories as possible. In the necessary absence of a course on systematic ontography in secondary schools, ontographic responses should be liberally introduced in connection with their physiographic controls. If, on the other hand, the high school is served by lower schools in which a good course on elementary physiography has been given by well-trained teachers to well-trained pupils, then the high school has manifestly two courses to offer. Regional physiography of the United States may be introduced in an early year so as to precede a later course in commercial geography, in advanced systematic physiography, or (should the subject approve itself when tried in colleges) systematic ontography.

The early regional course should be liberally broadened by including mention of features like those of the home country, but situated elsewhere in the world, and by abundant mention of organic responses to local physiographic features. It could thus be made disciplinary and educative in a high degree. The course on commercial geography is, if well founded on earlier physiographic courses and well developed in view of systematic ontography, destined to take an important place in the schools; but it must carefully avoid the danger of introducing too much empirical detail.

The course on more advanced systematic physiography could, if placed in a late high-school year, reach a stage of relatively rigorous discipline, for the inculcation of which more serious books, as well as better-prepared teachers and better-equipped laboratories, would be needed than are to be found today. If these suggestions seem visionary, one need only look at the extraordinary progress made in the last

¹"Physical Geography in the High School," *School Review*, September-October 1900.

fifty years of our school history to count upon the realization of all these schemes in the next fifty. It goes without saying that the courses thus instituted should be so well taught that they could be built upon by still more advanced work for those students who go to college.

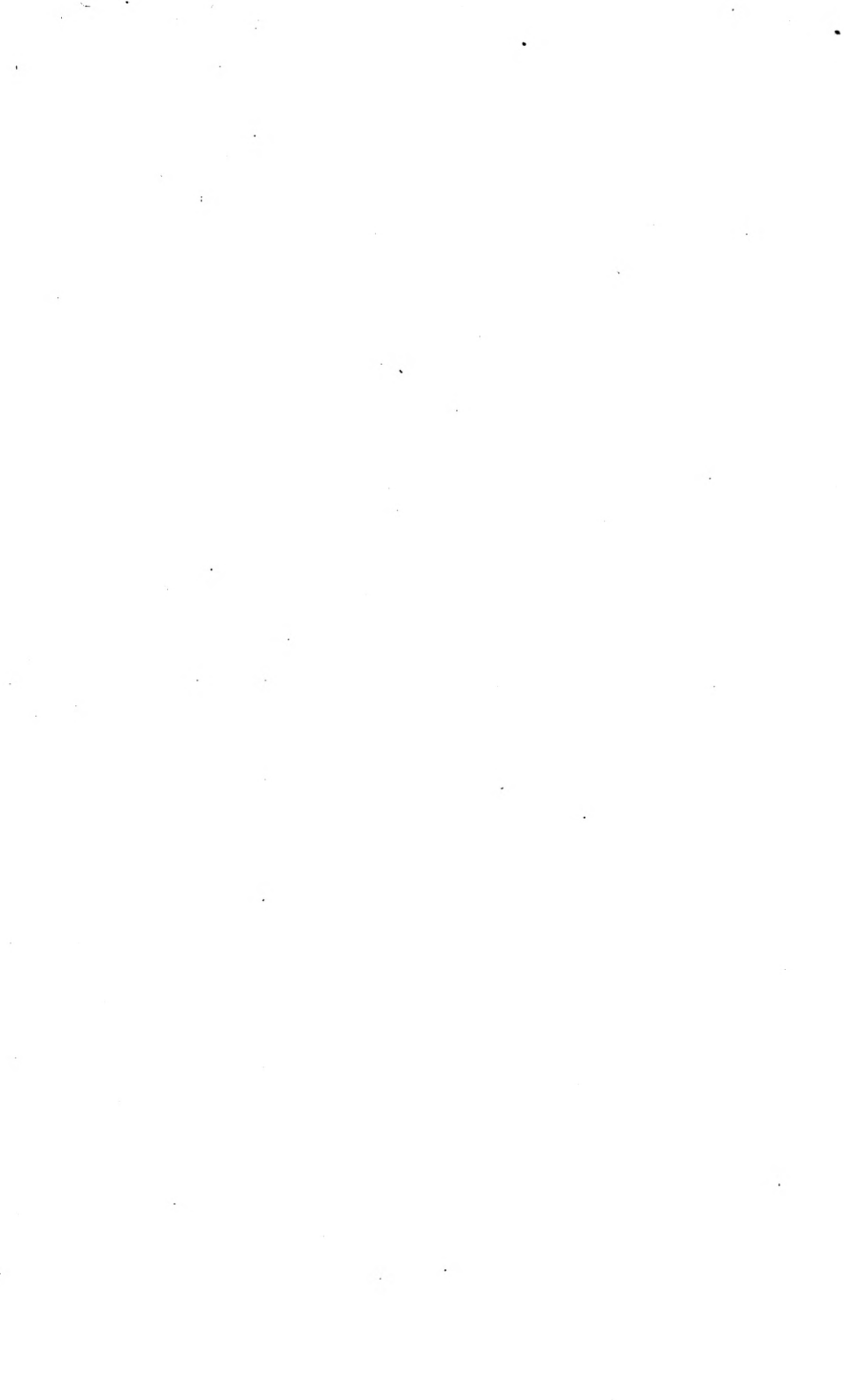
33. *Educational value of geography.*—There are two different standards by which the value of a school study may be measured. One is the so-called practical standard of use in life-work; the other is the more intellectual standard of capacity for enjoyment. There is no danger that this practical nation, with its marvelously rapid material progress, will fail to give due prominence to the practical side of school studies; there is some danger that the intellectual side may in a measure be neglected, from the very magnitude of our material prosperity.

The practical side of geography is best taught in a well-developed course of commercial geography placed in the later years of the high school, after earlier courses on general geography in the grades, and a course on elementary physiography either in the grades or in an early high-school year, as above suggested. Here, if anywhere, is it important that the principles of systematic cartography, developed as they should be by collegiate and university study, ought to find application. If commercial geography is to gain the place it deserves, it is of vital importance that it should be rationally taught as that part of regional geography in which man, the trader, responds so marvelously to his environing conditions. We have only to regret that the keen practical intelligence, by which the successful American of today has so greatly magnified the share taken by our country in the commercial geography of the world, finds so many analogies in the habits of the predatory species of the lower animals and in the behavior of the robber barons of feudal times. This suggests that commercial geography should be paralleled by a good course in ethics.

The intellectual profit of geography comes from the enjoyment that every active mind finds in really seeing the facts of the world about him. The great pleasure that has come to thousands of us, young and older, in recent years from the observational study of birds demonstrates the capacity, hitherto latent in that respect, of the average person for a high measure of simple, unpractical intellectual enjoyment. A corresponding pleasure is in store for those who learn, see, and appreciate the abundant facts and relationships of geography, many of which must enter into the experience of every life. If the

possibility of making a happy adjustment of oneself to his environment comes with the better appreciation of the order of nature, so much the better. It is evident, however, that the enjoyment of the opportunities of mature life will not have been increased for those whose school geography was merely a study of words in a book, or of names on a map, rather than of the meaningful facts of the world. Hence the intellectual no less than the practical value of geography will depend largely on the excellence with which it is taught.

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